# SECTION CL

# CLUTCH

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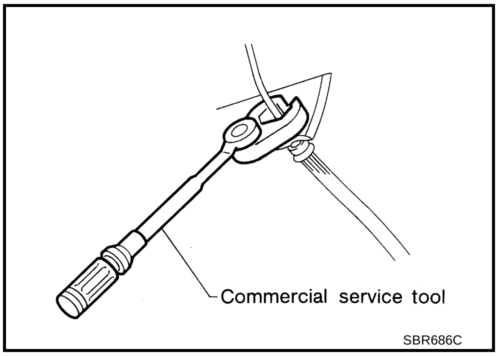
# PRECAUTIONS

PFP:00001

## Service Notice or Precautions

ACS007HL

- Recommended clutch fluid is brake fluid “DOT 3”. Refer to MA-10, "RECOMMENDED FLUIDS AND LUBRICANTS" .
- Do not reuse drained clutch fluid.
- Be careful not to splash clutch fluid on painted areas.
- Use a flare nut wrench, when removing and installing clutch piping.
- Use new clutch fluid to clean or wash all parts of master cylinder and operating cylinder.
- Do not use mineral oils such as gasoline or kerosene. It will corrode the rubber parts of the hydraulic system.




**WARNING:**

**After cleaning clutch disc, wipe it with a dust collector. Do not use compressed air.**

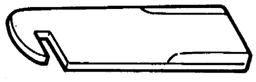
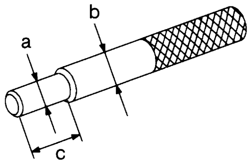
# PREPARATION

PFP:00002

## Special Service Tools

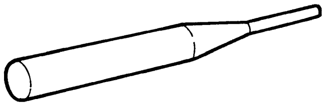
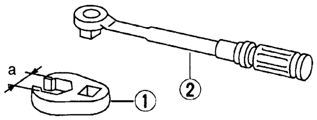
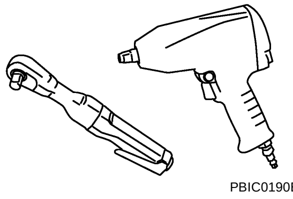
ACS007HM

The actual shapes of Kent-Moore tools may differ from those of special service tools illustrated here.

| Tool number<br>(Kent-Moore No.)<br>Tool name | Description |
|---|---|
| ST20050240<br>( — )<br>Diaphragm adjusting wrench<br><br>ZZA0508D | Adjusting unevenness of diaphragm spring of clutch cover |
| KV30101600<br>( — )<br>Clutch aligning bar<br>a: 15.9 mm (0.626 in) dia.<br>b: 17.9 mm (0.705 in) dia.<br>c: 40 mm (1.57 in)<br><br>S-NT405 | Installing clutch cover and clutch disc |

## Commercial Service Tools

ACS007HN

| Tool name | Description |
|---|---|
| Pin punch<br>Tip diameter: 4.5 mm (0.177 in) dia.<br><br>ZZA0515D | Removing and installing master cylinder spring pin |
| 1. Flare nut crowfoot<br>a: 10 mm (0.39 in)<br>2. Torque wrench<br><br>S-NT360 | Removing and installing clutch piping |
| Power tool<br><br>PBIC0190E | Loosening nuts and bolts |

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# NOISE, VIBRATION AND HARSHNESS (NVH) TROUBLESHOOTING

PFP:00003

## NVH Troubleshooting Chart

ACS007XH

Use the chart below to help you find the cause of the symptom. The numbers indicate the order of the inspection. If necessary, repair or replace these parts.

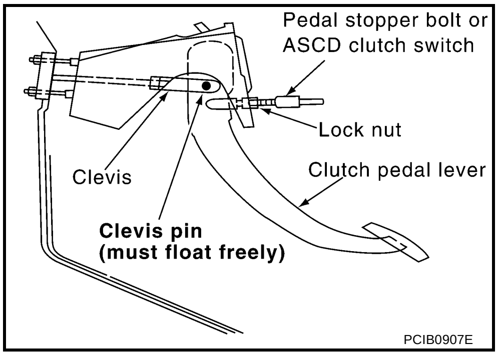
| Reference page | | CL-5 | CL-7 | CL-8 | CL-10 | EM-74 | CL-12 | CL-14 | CL-14 | CL-14 | CL-14 | CL-14 | CL-14 | CL-14 | CL-14 | CL-14 | CL-14 | CL-14 | EM-108 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SUSPECTED PARTS (Possible cause) | | CLUTCH PEDAL (Inspection and adjustment) | CLUTCH LINE (Air in line) | MASTER CYLINDER PISTON CUP (Damaged) | OPERATING CYLINDER PISTON CUP (Damaged) | ENGINE MOUNTING (Loose) | RELEASE BEARING (Worn, dirty or damaged) | CLUTCH DISC (Out of true) | CLUTCH DISC (Runout is excessive) | CLUTCH DISC (Lining broken) | CLUTCH DISC (Dirty or burned) | CLUTCH DISC (Oily) | CLUTCH DISC (Worn out) | CLUTCH DISC (Hardened) | CLUTCH DISC (Lack of spline grease) | DIAPHRAGM SPRING (Damaged) | DIAPHRAGM SPRING (Out of tip alignment) | PRESSURE PLATE (Distortion) | FLYWHEEL (Distortion) |
| Symptom | Clutch grabs/chatters | | | | | 1 | | | 2 | | | 2 | 2 | 2 | | | 2 | | |
| | Clutch pedal spongy | | 1 | 2 | 2 | | | | | | | | | | | | | | |
| | Clutch noisy | | | | | | 1 | | | | | | | | | | | | |
| | Clutch slips | 1 | | | | | | | | | | 2 | 2 | | | 3 | | 4 | 5 |
| | Clutch does not disengage | 1 | 2 | 3 | 4 | | | 5 | 5 | 5 | 5 | 5 | | | 5 | 6 | 6 | 7 | |

# CLUTCH PEDAL

PFP:46540

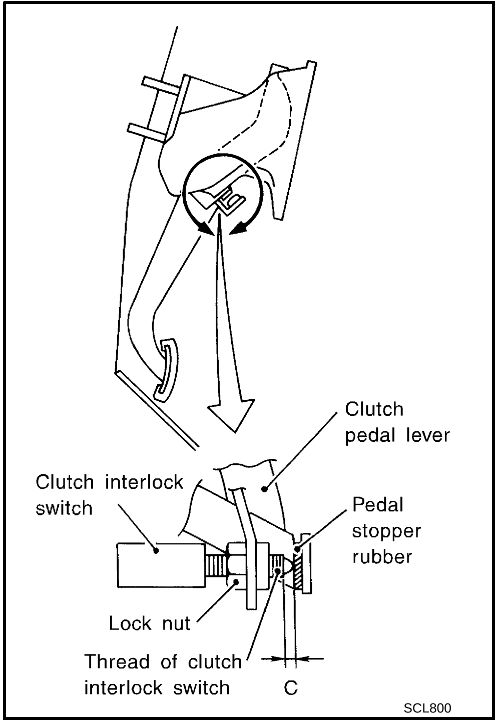
## On-Vehicle Inspection and Adjustment

ACS007XI



PCIB0907E

1. Make sure that clevis pin floats freely in the bore of clutch pedal. It should not be bound by clevis or clutch pedal.
   a. If clevis pin is not free, make sure that pedal stopper bolt or ASCD clutch switch is not applying pressure to clutch pedal causing clevis pin to bind. To adjust, loosen lock nut and turn pedal stopper bolt or ASCD clutch switch.
   b. Tighten lock nut.
   c. Make sure that clevis pin floats in the bore of clutch pedal. It should not be bound by clutch pedal.
   d. If clevis pin is still not free, remove clevis pin and check for deformation or damage. Replace clevis pin if necessary. Leave the pin removed for step 2.
2. Check clutch pedal stroke for free range of movement.
   a. With clevis pin removed, manually move clutch pedal up and down to determine if it moves freely.
   b. If any sticking is found, replace related parts (clutch pedal bracket, assist spring, bushing etc.) Re-assemble clutch pedal and again make sure that clevis pin floats freely in the bore of clutch pedal.
3. Adjust clearance “C” while depressing clutch pedal fully. (With clutch interlock switch)



SCL800

**Clearance “C”: 0.3 - 1.0mm (0.012 - 0.039 in)**

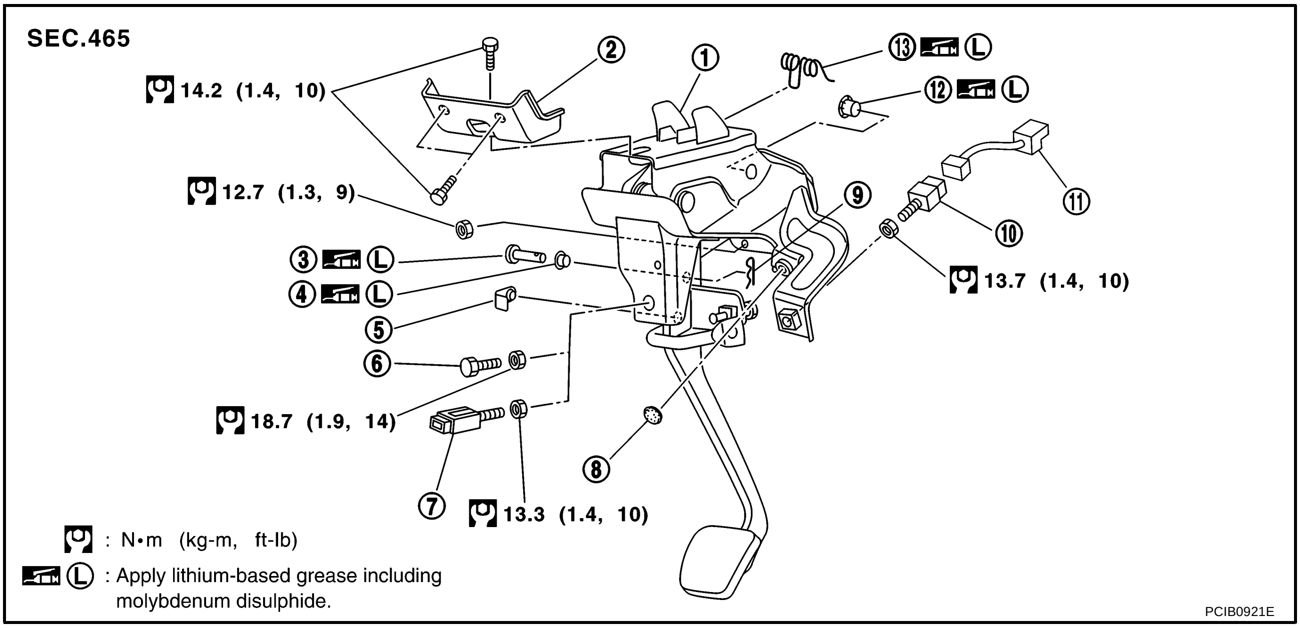
4. Check clutch hydraulic and system components (clutch master cylinder, clutch operating cylinder, clutch withdrawal lever, clutch release bearing, etc.) for sticking or binding.
   a. If any sticking or binding is found, repair or replace related parts as necessary.
   b. If hydraulic system repair was necessary, bleed the clutch hydraulic system. Refer to CL-7, "Air Bleeding Procedure" .

   **NOTE:**
   Do not use a vacuum assist or any other type of power bleeder on this system. Use of a vacuum assist or power bleeder will not purge all the air from the system.

## Removal and Installation

ACS007XJ

### COMPONENTS




| | | | | | |
|---|---|---|---|---|---|
| 1. | Clutch pedal assembly | 2. | Bracket | 3. | Clevis pin |
| 4. | Bushing | 5. | Stopper rubber | 6. | Pedal stopper bolt (Without ASCD) |
| 7. | ASCD clutch switch (With ASCD) | 8. | Stopper rubber | 9. | Snap pin |
| 10. | Clutch interlock switch | 11. | Sub harness | 12. | Bushing |
| 13. | Assist spring | | | | |

### REMOVAL

1. Remove instrument driver lower panel. Refer to IP-10, "INSTRUMENT PANEL ASSEMBLY" .
2. Disconnect clutch interlock switch and ASCD clutch switch (with ASCD) harness connectors.
3. Remove snap pin and clevis pin from clevis of clutch master cylinder.
4. Remove clutch pedal assembly mounting nuts and bolts, and then remove clutch pedal assembly from the vehicle.

### INSPECTION AFTER REMOVAL

- Check clutch pedal for bend, damage, or a cracked weld. If bend, damage, or a cracked weld is found, replace clutch pedal.
- Check assist spring for settling. If settling is found, replace assist spring.

### INSTALLATION

Installation is the reverse order of removal.

**NOTE:**

Tighten pedal stopper bolt lock nut or ASCD clutch switch lock nut to the specified torque after installing clutch pedal assembly in vehicle and adjusting the pedal free play.

# CLUTCH FLUID

PFP:00017

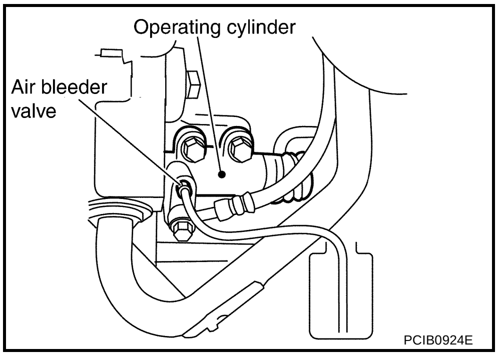
## Air Bleeding Procedure

ACS007XK

**NOTE:**
Do not use a vacuum assist or any other type of power bleeder on this system. Use of a vacuum assist or power bleeder will not purge all the air from the system.

**CAUTION:**

- **Monitor clutch fluid level in reservoir tank to make sure it does not empty.**
- **Keep painted surface on the body or other parts free of clutch fluid. If it spills, wipe up immediately and wash the affected area with water.**
- Bleed the air of operating cylinder.



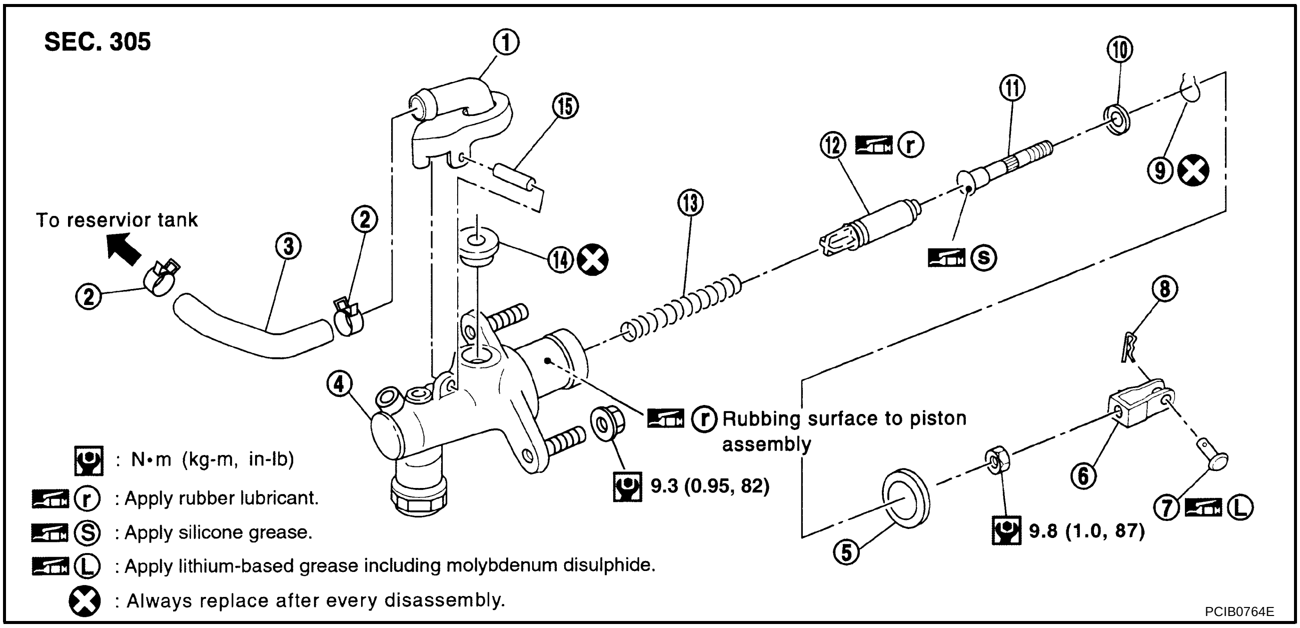

1. Fill master cylinder reservoir tank with new clutch fluid.
2. Connect a transparent vinyl hose to air bleeder valve.
3. Depress clutch pedal slowly and fully several times at an interval of 2 to 3 seconds and hold it.
4. With clutch pedal depressed, open air bleeder valve to release air.
5. Close air bleeder valve.
6. Release clutch pedal and wait for 5 seconds.
7. Repeat steps 3 to 6 until no bubbles can be observed in clutch fluid.
8. Tighten air bleeder valve to the specified torque. Refer to CL-10, "Components" .

# CLUTCH MASTER CYLINDER

PFP:30610

## Components

ACS007ZT




| | | | | | |
|---|---|---|---|---|---|
| 1. | Nipple | 2. | Clamp | 3. | Hose |
| 4. | Cylinder body | 5. | Seat | 6. | Clevis |
| 7. | Clevis pin | 8. | Snap pin | 9. | Stopper ring |
| 10. | Stopper | 11. | Push rod | 12. | Piston assembly |
| 13. | Return spring | 14. | Seal | 15. | Spring pin |

## Removal and Installation

ACS007XL

### REMOVAL

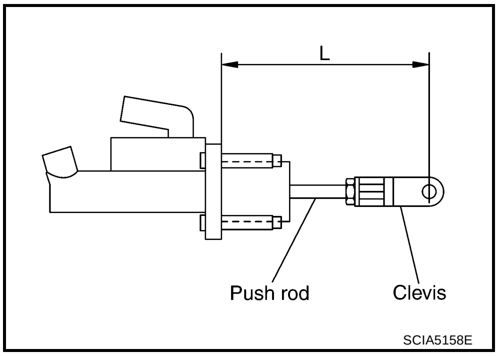
1. Using one of the following methods, remove hose from nipple.
   - Drain clutch fluid from reservoir tank and remove hose.
   - Remove hose from nipple. Immediately plug hose and reservoir tank to prevent clutch fluid from dripping.

   **CAUTION:**
   **Keep painted surface on the body or other parts free of clutch fluid. If it spills, wipe up immediately and wash the affected area with water.**
2. Remove clutch tube using a flare nut wrench.
3. Remove snap pin and clevis pin on clevis in passenger compartment to separate clutch pedal.
4. Remove mounting nuts on master cylinder assembly, and then master cylinder assembly from the vehicle.

### INSTALLATION

1. Check position of clevis and push rod. If measurement is outside the standard length, adjust position of clevis and push rod.

   **Length "L": 122.0 mm (4.80 in)**



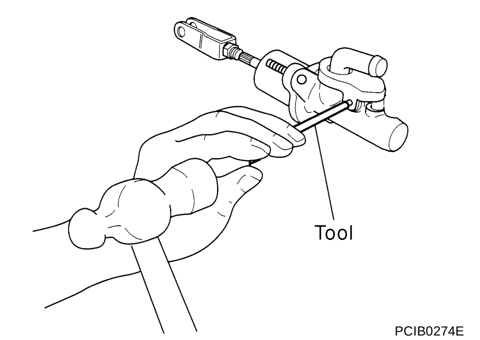

2. Connect clutch tube to master cylinder assembly and temporarily tighten flare nut.
3. Install master cylinder assembly and tighten mounting nut to the specified torque. Refer to CL-8, "Components" .
4. Tighten clutch tube flare nut to the specified torque using a flare nut torque wrench. Refer to CL-11, "Removal and Installation" .
5. Set clevis to clutch pedal and insert clevis pin.
6. Attach snap pin to clevis pin.
7. Install hose to nipple.

8. After completing this procedure, inspect and adjust for clutch pedal and then bleed the air from the clutch hydraulic system. Refer to CL-5, "On-Vehicle Inspection and Adjustment" and CL-7, "Air Bleeding Procedure" .

## Disassembly and Assembly

ACS007YZ

### DISASSEMBLY



PCIB0274E

1. Remove spring pin, using a pin punch.
2. Remove nipple and seal from cylinder body.
3. Loosen push rod lock nut then remove clevis and lock nut, if necessary.

   **NOTE:**
   Clutch pedal height is controlled with position of clevis and push rod.
4. Remove seat from cylinder body.
5. Remove stopper ring and stopper. Remove push rod from cylinder body while holding it securely to prevent piston assembly popping out.
6. Remove piston assembly and return spring.

### INSPECTION AFTER DISASSEMBLY

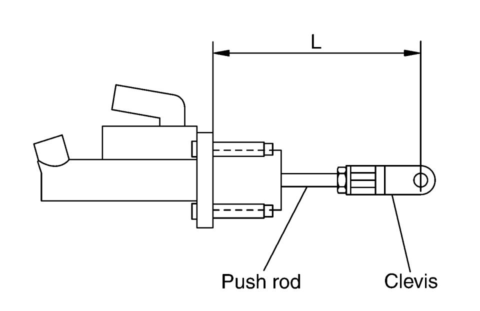
Check for any of the conditions shown below. If any malfunction is found, replace the part concerned.

- Damaged cylinder internal wall, foreign matter, wear, corrosion, or pinhole
- Damaged or deformed nipple or reservoir tank
- Settling of return spring
- Cracked or deformed seat

### ASSEMBLY

1. Apply rubber lubricant to the internal surface of cylinder body, the sliding surface of piston assembly, and piston cup. Insert return spring and piston assembly to cylinder body.
2. Apply silicon grease to push rod and install stopper. Install stopper ring while holding down push rod by hand to prevent piston assembly from popping out.
3. Install seat to cylinder body.
4. Install seal and nipple to cylinder body. Install spring pin, using a pin punch.
5. Install clevis to push rod.
6. Check and adjust the positions of clevis and push rod. After adjusting "L", tighten lock nut to the specified torque. Refer to CL-8, "Components" .

   **Length "L": 122.0 mm (4.80 in)**



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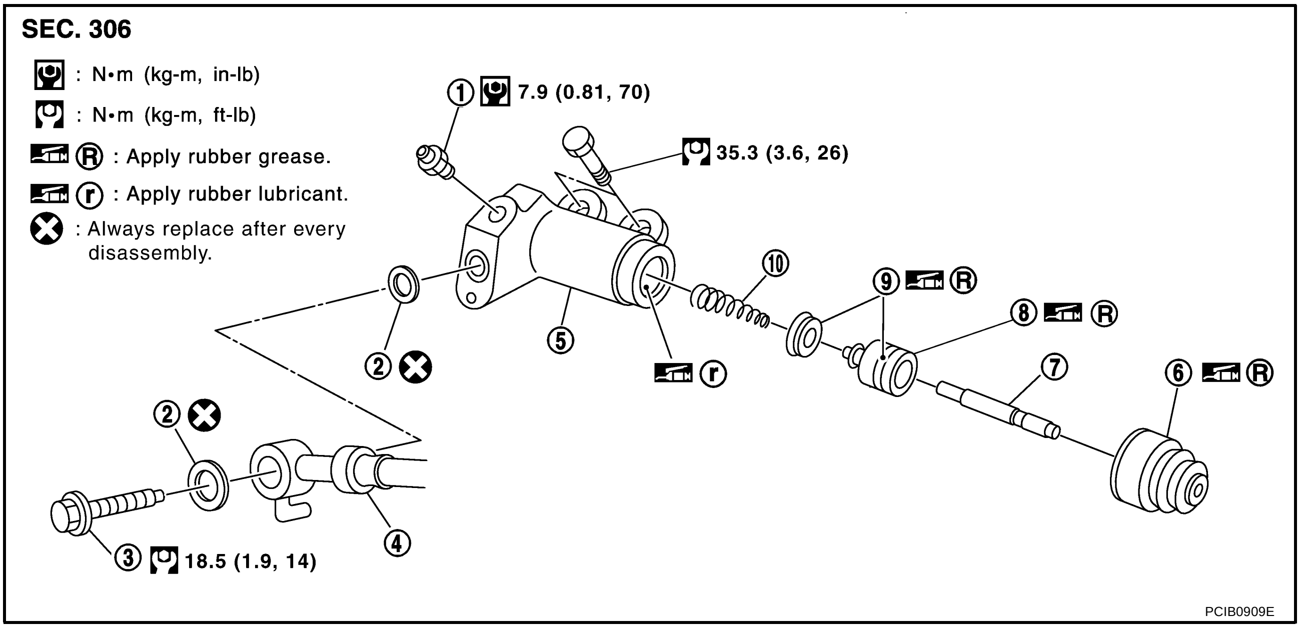
# OPERATING CYLINDER

PFP:30620

## Components

ACS007ZU




| | | | | | |
|---|---|---|---|---|---|
| 1. | Air bleeder valve | 2. | Copper washer | 3. | Union bolt |
| 4. | Clutch hose | 5. | Cylinder body | 6. | Dust cover |
| 7. | Push rod | 8. | Piston assembly | 9. | Piston cup |
| 10. | Piston spring | | | | |

## Removal and Installation

ACS007XN

### REMOVAL

1. Drain clutch fluid.

   **CAUTION:**

   **Keep painted surface on the body or other parts free of clutch fluid. If it spills, wipe up immediately and wash the affected area with water.**
2. Remove clutch hose from operating cylinder.
3. Remove operating cylinder mounting bolt and remove operating cylinder from the vehicle.

### INSTALLATION

Note the following, and install in the reverse order of removal.

- Install hose with care so that it will not be bent or twisted.
- After completing the procedure, bleed the air from the clutch hydraulic system. Refer to CL-7, "Air Bleeding Procedure" .

## Disassembly and Assembly

ACS007XO

### DISASSEMBLY

- Remove dust cover and push rod. Then remove piston, piston cup, and piston spring from inside cylinder body.

### INSPECTION AFTER DISASSEMBLY

Check for any of the conditions shown below. If any malfunction is found, replace the part concerned.

- Damage to cylinder internal surface or piston sliding surface. Foreign matter, wear, corrosion, or pinhole
- Settling of piston spring
- Cracked or deformed dust cover

### ASSEMBLY

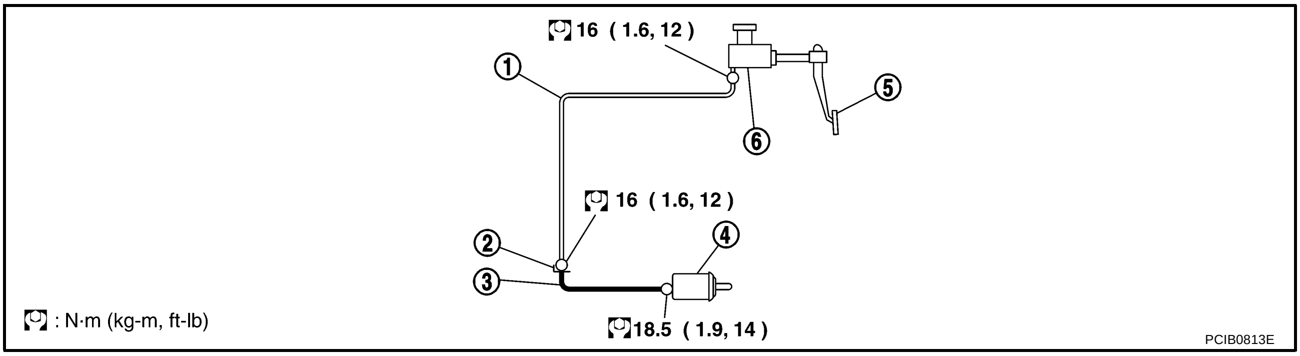
1. Apply rubber lubricant to cylinder body internal surface and rubber grease to piston cup and piston. Insert piston assembly and piston spring into cylinder body.
2. Apply rubber grease to dust cover and install push rod and dust cover.

# CLUTCH PIPING

PFP:30650

## Removal and Installation

ACS007XP

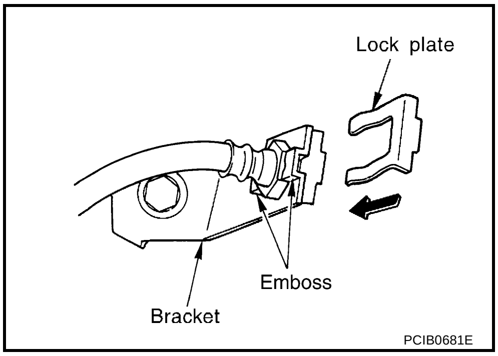



| | | | | | |
|---|---|---|---|---|---|
| 1. | Clutch tube | 2. | Lock plate | 3. | Clutch hose |
| 4. | Operating cylinder | 5. | Clutch pedal | 6. | Master cylinder |

Carefully observe the following steps during clutch tube removal and installation.

**CAUTION:**

**Keep painted surface on the body or other parts free of clutch fluid. If it spills, wipe up immediately and wash the affected area with water.**




- To fix clutch hose on bracket, position clutch hose clasp on the emboss of bracket and drive lock plate vertically from above. Be careful not to bend or twist clutch hose. Do not scratch or damage clutch hose.
- Tighten clutch tube flare nut to the specified torque.
- Tighten clutch hose union bolt to the specified torque.

  **CAUTION:**

  **Do not reuse copper washer.**
- After installation, bleed the air from the clutch hydraulic system. Refer to CL-7, "Air Bleeding Procedure" .

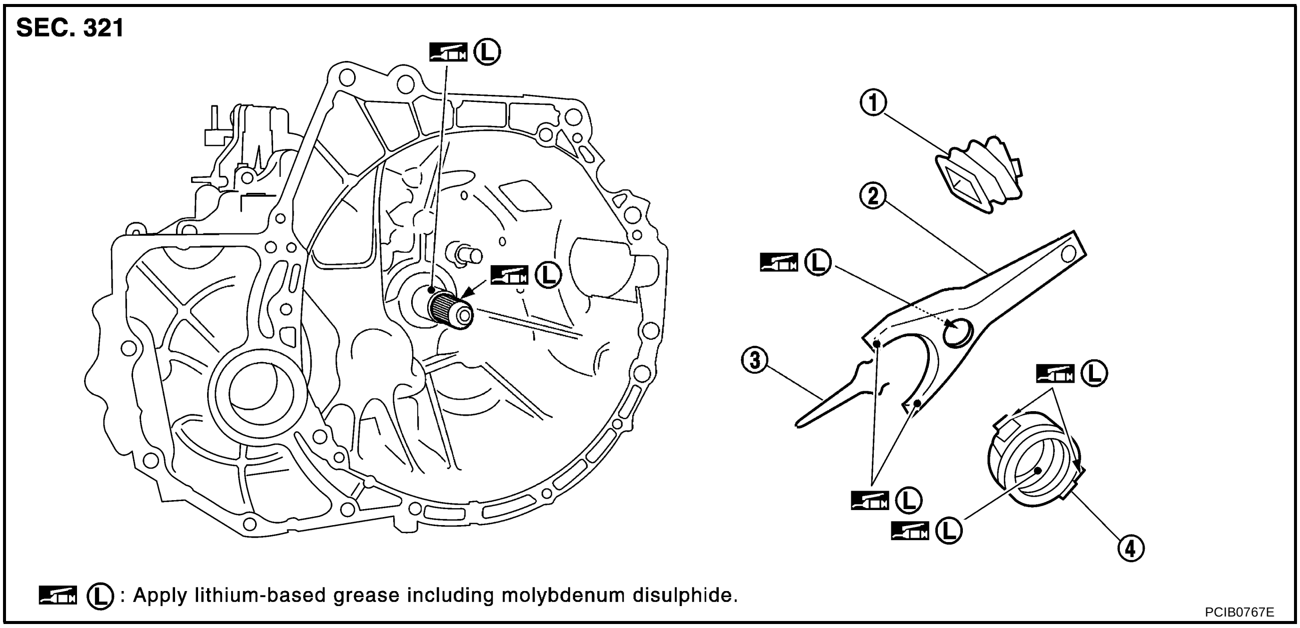
# CLUTCH RELEASE MECHANISM

PFP:30502

## Removal and Installation

ACS007XQ

### COMPONENTS



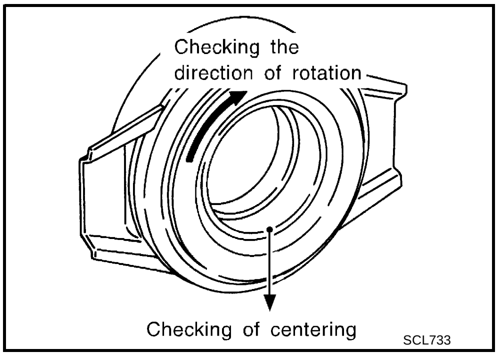

1. Dust cover
2. Withdrawal lever
3. Retainer spring
4. Release bearing

### REMOVAL

1. Remove manual transaxle from the vehicle. Refer to MT-17, "Removal and Installation" .
2. Remove release bearing, withdrawal lever from inside clutch housing.
3. Remove dust cover.
4. Remove retainer spring from withdrawal lever.

### INSPECTION AFTER REMOVAL

- If release bearing is seized, damaged, not properly centered or does not rotate smoothly, replace it.
- If contact surface of withdrawal lever is excessively worn, replace it.
- If dust cover is cracked, replace it.

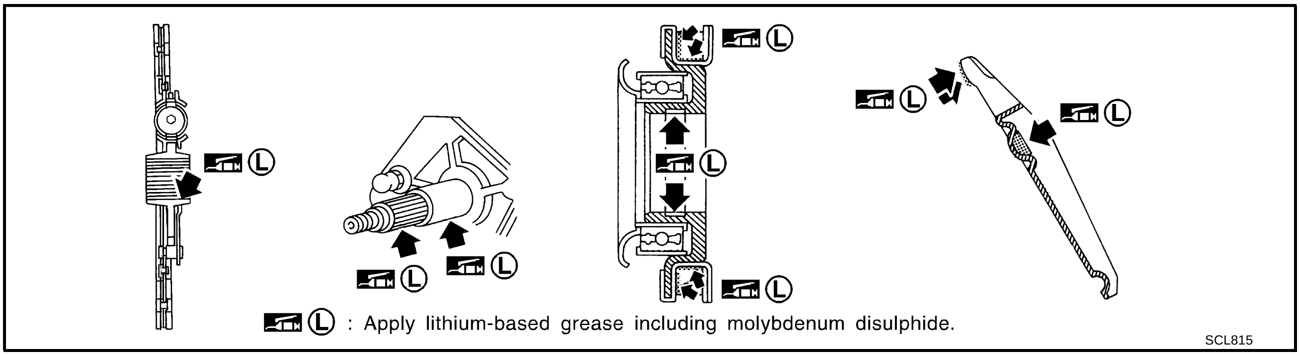



### INSTALLATION

**CAUTION:**

- **Be sure to apply grease to the points specified. Otherwise, noise, poor disengagement, or damage to the clutch may result. Excessive grease may cause slip or judder. Wipe off any grease oozing from the parts.**
- **Be careful not to bring any grease to the clutch disk facing, pressure plate surface, and flywheel surface.**

1. Following the instructions below, apply grease to the specified points.




**CAUTION:**
**Wipe off any old grease, debris, or powdery residue left on the grease applying surfaces.**

- Evenly apply approximately 1 mm (0.04 in) thick coating of recommended grease to withdrawal lever and release bearing sliding surface.
- Apply recommended grease to withdrawal lever ball pin contact surface and inner slots of release bearing. The grease surface should be level with the surrounding area.
- Apply a thin coat of recommended grease evenly to release bearing sliding surface. Install release bearing. Wipe off any excess grease that oozes from the parts and then remove release bearing.

2. Install in the reverse order of removal.

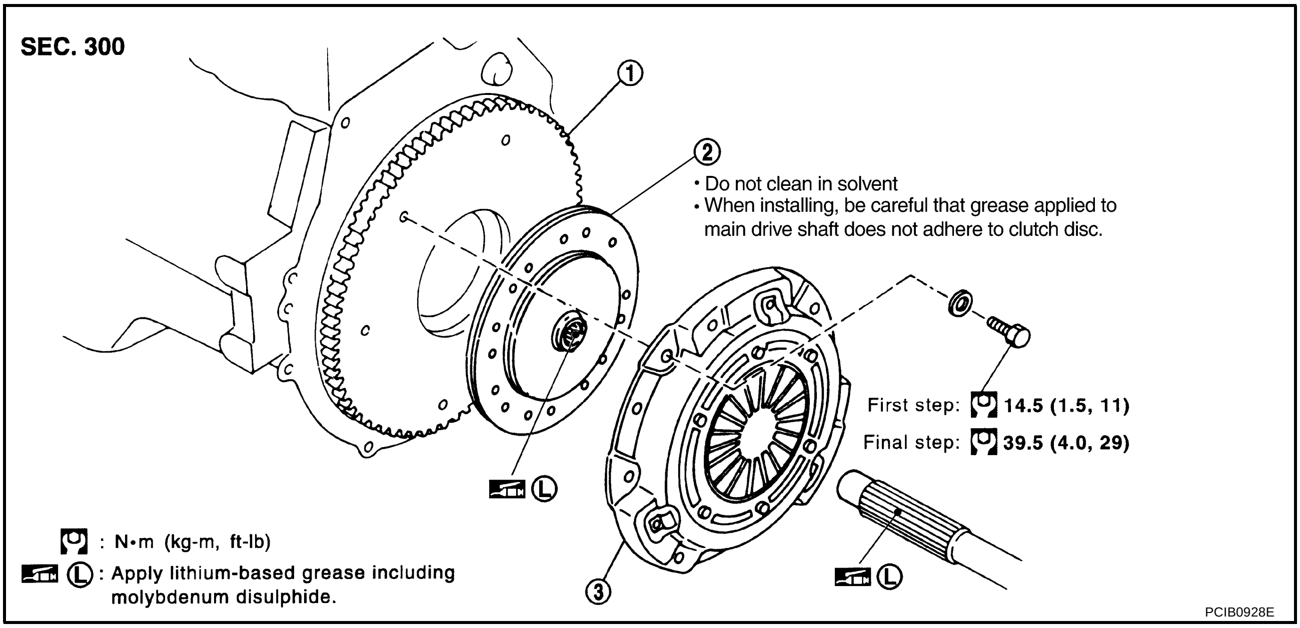
# CLUTCH DISC, CLUTCH COVER AND FLYWHEEL

PFP:30100

## Removal and Installation

ACS007XR

### COMPONENTS




1. Flywheel
2. Clutch disc
3. Clutch cover

**CAUTION:**

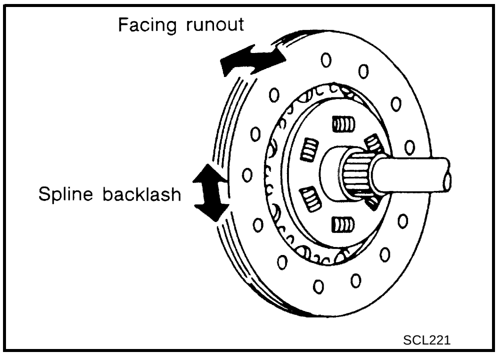
**Be careful not to bring any grease to the clutch disc facing, pressure plate surface, and flywheel surface.**

### REMOVAL

1. Remove manual transaxle from the vehicle. Refer to MT-17, "Removal and Installation" .
2. Loosen clutch cover mounting bolts evenly with power tool. Then remove clutch cover and clutch disc.

### INSPECTION AND ADJUSTMENT AFTER REMOVAL

#### Clutch Disc




- Measure circumferential runout relative to clutch disc center spline. If it is outside the specification, replace clutch disc.

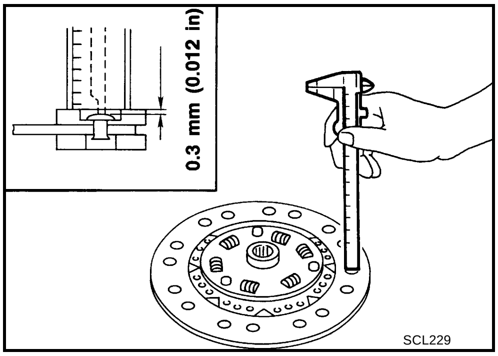
  **Runout limit/diameter of the area to be measured:**

  **1.0 mm (0.039 in)/230 mm (9.06 in) dia.**

- Measure backlash to clutch disc spline and input shaft spline at the circumference of clutch disc. If outside the specification, replace clutch disc.

  **Maximum allowable spline backlash:**

  **1.0 mm (0.039 in)**

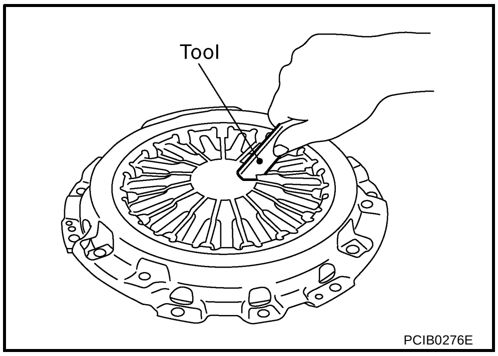



- Using calipers, measure the depth to clutch disc facing rivet heads. If it exceeds the allowable wear limit, replace clutch disc.

  **Facing wear limit (depth to the rivet head):**

  **0.3 mm (0.012 in)**

## Clutch Cover




Check diaphragm spring lever claws for unevenness with the lever still on the vehicle. If they exceed the tolerance, adjust lever height using the diaphragm adjusting wrench.

**Tolerance for diaphragm spring lever unevenness:**

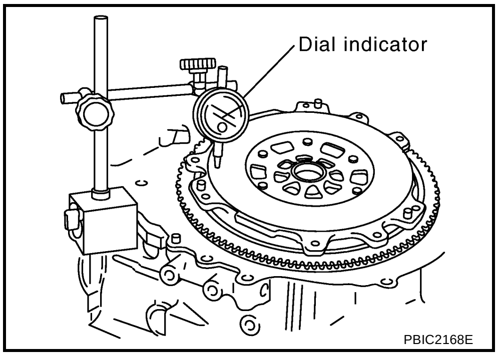
**0.7 mm (0.028 in) or less**

**Tool number : ST20050240 ( — )**

- Check clutch cover thrust ring for wear or breakage. If wear or breakage is found, replace clutch cover assembly.

  **NOTE:**
  - Worn thrust ring will generate a beating noise when tapped at the rivet with a hammer.
  - Broken thrust ring will make a clinking sound when cover is shaken up and down.
- If a trace of burn or discoloration is found on the clutch cover pressure plate to clutch disc contact surface, repair the surface with sandpaper. If surface is damaged or distorted, replace the assembly.

## Flywheel Runout




Using a dial indicator, measure runout at the flywheel clutch contact surface. If runout is outside the specification, replace flywheel. If a trace of burn or discoloration is found on the surface, repair it with sandpaper.

**Allowable flywheel runout:**

**Refer to EM-108, "FLYWHEEL DEFLECTION (M/T MODELS)" .**

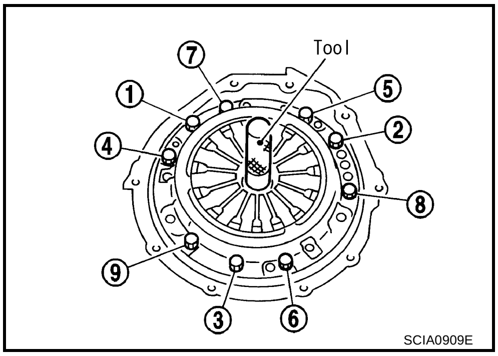
**CAUTION:**
**Measure it at flywheel outer face (not on knock pin and clutch cover mounting hole).**

## INSTALLATION

1. Apply recommended grease to clutch disc and input shaft splines.

   **CAUTION:**
   **Be sure to apply grease to the points specified. Otherwise, noise, poor disengagement, or damage to the clutch may result. Excessive grease may cause slip or judder. Wipe off any grease oozing from the parts.**
2. Install clutch disc and clutch cover. Pre-tighten mounting bolts and install clutch aligning bar.

   **Tool number : KV30101600 ( — )**




3. Tighten clutch cover mounting bolts evenly in two steps in the order shown in the figure. Refer to CL-14, "COMPONENTS" .
4. Install manual transaxle. Refer to MT-17, "Removal and Installation" .

# SERVICE DATA AND SPECIFICATIONS (SDS)

PFP:00030

## Clutch Control System

*ACS007XS*

| | |
|---|---|
| Type of clutch control | Hydraulic |

## Clutch Master Cylinder

*ACS007XT*

| | |
|---|---|
| Inner diameter | 15.87 mm (5/8 in) |

## Clutch Operating Cylinder

*ACS007XU*

| | |
|---|---|
| Inner diameter | 19.05 mm (3/4 in) |

## Clutch Disc

*ACS007XV*

| | |
|---|---|
| Facing size<br>(outer dia. x inner dia. x thickness) | 240 mm × 160 mm × 3.5 mm (9.45 in × 6.30 in × 0.138 in) |
| Thickness of disc assembly with load | 7.90 - 8.30 mm (0.3110 - 0.3268 in) with 5,688 N (580 kg, 1,279 lb) |
| Wear limit of facing surface to rivet head | 0.3 mm (0.012 in) |
| Runout limit/diameter of the area to be measured | 1.0 mm (0.039 in) / 230 mm (9.06 in) dia. |
| Maximum spline backlash<br>(at outer edge of disc) | 1.0 mm (0.039 in) |

## Clutch Cover

*ACS007XW*

| | |
|---|---|
| Set-load | 5,884 N (600 kg, 1,323 lb) |
| Diaphragm spring lever height | 37.0 - 39.0 mm (1.457 - 1.535 in) |
| Uneven limit diaphragm spring toe height | 0.7 mm (0.028 in) or less |

## Clutch Pedal

*ACS007ZV*

| | |
|---|---|
| Clearance ″C″ between pedal stopper rubber and clutch interlock switch threaded while clutch pedal is fully depressed | 0.3 - 1.0 mm (0.012 - 0.039 in) |